Vol. 17 SEPTEMBER, 1952 No. 9

CORNELL-DUBILIER ELECTRIC CORP.
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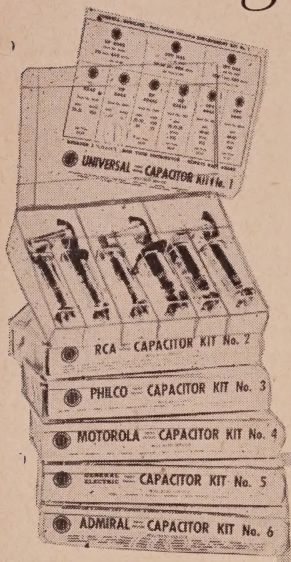
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T. V. FIELD STRENGTH METERS

As a service instrument, the field strength meter is invaluable to the television technician for checking signal strengths before undertaking installations in areas of doubtful reception, and for antenna orientation. A secondary use of the field strength meter is the measurement of interference radiated by some television receivers.

While the necessity for and the techniques of field strength measurements are well known to radio amateurs, the field strength meter is a comparatively strange instrument to service technicians. Before television, there was no need for servicemen to make field strength surveys in connection with receiver installation. Regrettably, the simple field strength meters employed by radio amateurs for checking transmitters do not have the sensitivity required for t. v. measurements. This paper describes the more complex arrangements employed in practical t. v. field strength meters.

Four types of field strength meters have been applied to television use. They are: (1) superheterodyne, (2) tuned r. f., (3) heterodyne, and (4) receiver clip-in types. The latter is known familiarly as a "t. v. compass." The first and fourth types are found most often in current use. The superheterodyne instrument is the most sensitive type in the group which requires no connection to a t. v. receiver. The t. v. compass is the simplest but must be connected to a receiver. Commercial superhet-type field strength meters are available with indicating meters reading directly in microvolts.

Superhet Type

The superhet-type field strength meter is made up of the following stages: (1) t. v. front end consisting of r. f. amplifier, mixer, and oscillator; (2) video intermediate frequency amplifier; (3) video 2nd detector; and (4) indicating meter. Figure 1 shows a skeleton circuit of this type of field strength meter.

From Figure 1, it is seen that the superhet-type instrument contains all of the receiver picture circuits except the video amplifier. The conventional video detector has been replaced with an r. f. voltmeter consisting of a 1N34 germanium diode and d. c. microammeter. Deflection of the meter is proportional to carrier strength of the received signal. Note that no a. v. c. is employed in this circuit.

The front end tuner can be of any standard design. The variable cathode resistor in the 1st i. f. stage allows the i. f. amplifier gain to be pre-set for a reference deflection of the output meter with a standard input signal amplitude.

The superhet-type field strength meter has the advantage of high sensitivity. Input signals of a few microvolts, considerably lower than the recognized fringe-area signal strength of 500 microvolts per meter, may be measured readily. The circuit also is stable, and the output meter therefore may be calibrated directly in microvolts by means of input signals from a laboratory-type signal generator with calibrated output. Commercial t. v.

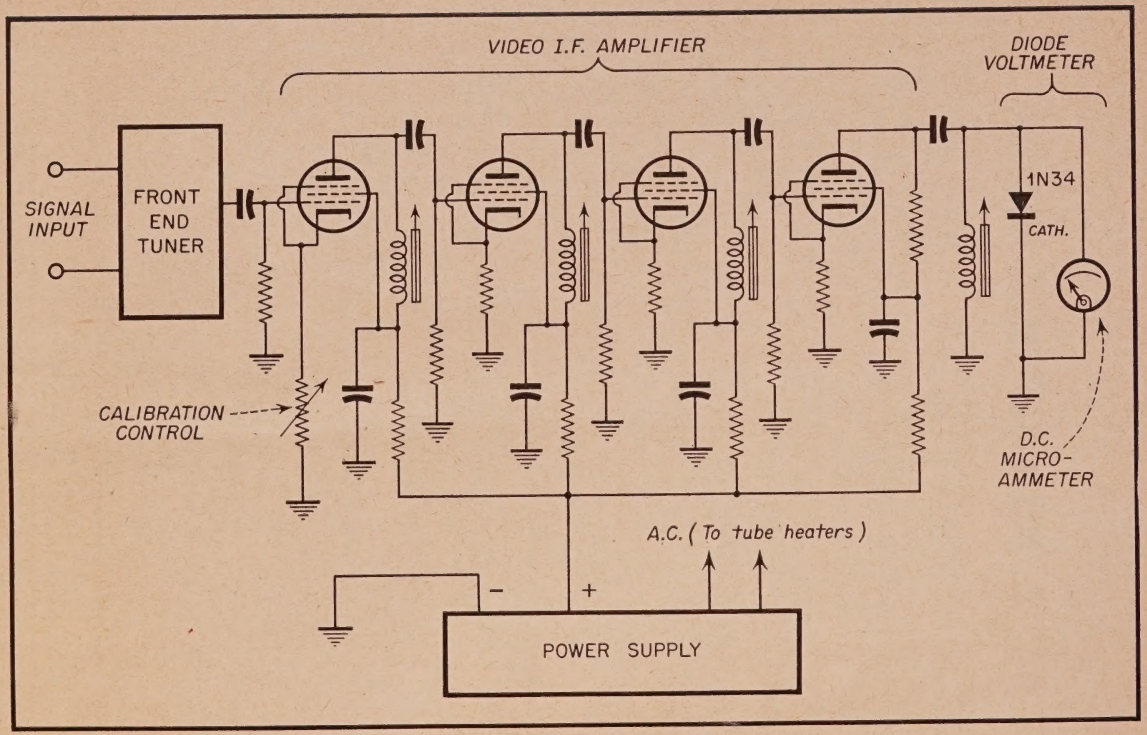


Fig. 1. Superhet-type field strength meter.

field strength meters of this type are 115 volt a. c.-operated, making it necessary to run a power line to the roof top when making antenna orientations. This is a slight disadvantage in some instances. A completely portable instrument using small, lightweight A and B batteries has not yet appeared on the market.

Technicians caring to build superhet--type field strength meters may choose from a variety of front end and video i. f. amplifier circuits. The easiest procedure will be to obtain a manufactured tuner and i. f. strip. The only requirements are that the front end allow fine tuning in each t. v. channel and that the i. f. amplifier provide as much gain as possible. The front end should have both 72- and 300-ohm inputs, for maximum utility. The four i. f. stages shown in Figure 1 usually will suffice when using tubes such as the 6AU6. Some designers prefer to connect a 50,000- or 100,000-ohm rheostat in series with the output microammeter and ground, as a calibration control, instead of the 1st i. f. amplifier cathode rheostat.

In view of the fact that the field strength meter will be used a great deal in antenna orientation, every effort should be made to keep a home-built instrument as light in weight and small in size as possible for easy handling on roof tops and ladders. The focus of attention in weight reduction is the power supply, with the power transformer as the heaviest component.

Tuned R. F. Type

Somewhat less sensitive than the superhet type is the tuned r. f. field strength meter. A skeleton circuit of this type of instrument is shown in Figure 2. This instrument is much the simpler of the two, consisting of a tuned radio-frequency amplifier (tuneable to each of the t. v. channel frequencies) followed by a simple detector and output meter.

The tuned r. f. field strength meter may be made from a regular t. v. booster (which furnishes the tuned amplifier), simply by adding 2 crystal diodes, 2 resistors, 1 rheostat, and a d. c. microammeter, as shown in Figure 2. The diodes and fixed resistors provide a full-wave, bridge-type rectifier which detects the signal and delivers d. c. to deflect the output meter.

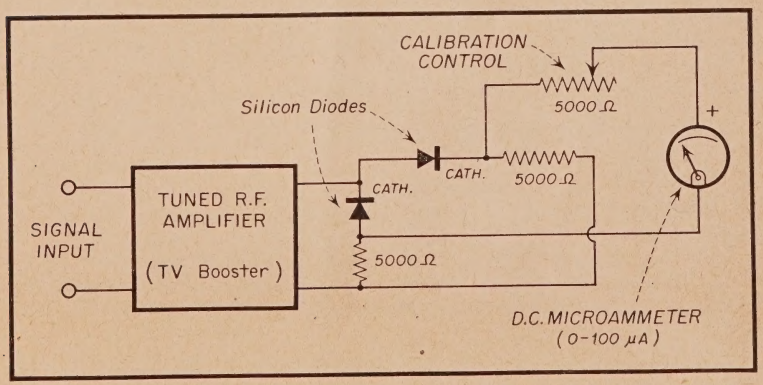


Fig. 2. Tuned R.F.-type field strength meter.

The meter deflection is proportional to the average value of the received carrier. Silicon diodes are specified, since they provide more efficient detection at the higher t. v. channel frequencies than do the more common germanium diodes. A 5000-ohm wirewound rheostat in series with the microammeter serves as a calibration control, allowing the meter to be set to a standard deflection with an accurately-known calibration signal.

The tuned r. f. field strength meter has the advantages of simplicity and economy. It can be built easily and does not present the difficult alignment problems of the superhet. It has somewhat of a disadvantage, however, in that the gain of the r. f. amplifier and the rectification efficiency of the crystal diodes may not be constant for the various t. v. channels. This means that a correction will have to be applied if the meter is to read directly in microvolts.

Like the superhet-type field strength meter, the tuned r. f. instrument will require a. c. power for its operation if a commercial t. v. booster is used as the r. f. amplifier. This will impose no hardship, except when the instrument is used for antenna rotation adjustments and a power line has to be extended to the roof top. It appears entirely plausible, however, to construct a tuned r. f. amplifier employing battery tubes such as acorn pentodes, and thus to make this instrument completely portable.

As far as the Editors have been able to determine, no manufactured version of the tuned r. f. t. v. field strength meter is on the market at this writing.

Heterodyne Type

The heterodyne-type t. v. field strength meter (See Figure 3) resem-

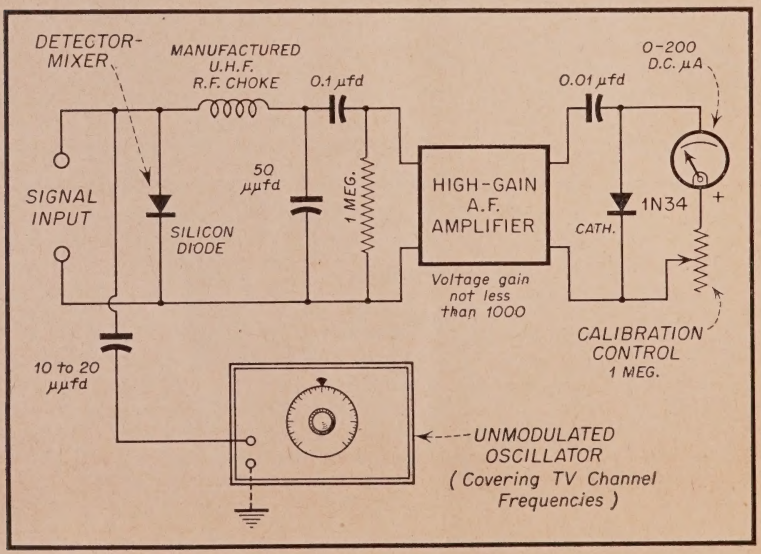


Fig. 3. Heterodyne-type field strength meter.

bles the combination heterodyne monitor and frequency meter employed by transmitting radio amateurs. And it operates on the same principle.

This arrangement consists of a crystal-diode mixer, unmodulated oscillator covering the t. v. channel frequencies, high-gain a. f. voltage amplifier, and high-resistance a. f. output meter.

A silicon diode is preferred in the detector-mixer position, since the detection efficiency of this type is markedly better at the higher t. v. channel frequencies than that of familiar germanium types. This detector is aperiodic, responding to any frequency reaching it via the input terminals of the instrument. The desired signal is searched out, however, with the c. w. oscillator which is tuned to beat with the signal.

The beat-note output of the detector-mixer is amplified by a high-gain audio amplifier. Output of the amplifier deflects a 1N34-type crystal voltmeter. Meter deflection is proportional to the input signal strength. The sensitivity of the field strength meter is limited by the amplifier gain. A voltage gain of at least 1000 is recommended. The output stage of the amplifier must deliver a moderate amount of power in order satisfactorily to drive the crystal voltmeter.

Using an input signal of accurately-known amplitude, the 1-megohm rheostat in series with the microammeter is adjusted to give a predetermined checking deflection of the meter. For this calibration, the amplifier gain control should be set for a level somewhat less than full gain. This will allow leeway of adjustment to compensate for ageing tubes and other circuit components.

The heterodyne-type field strength meter may be constructed easily by any technician experienced in ultra-high frequency circuitry. The c. w. oscillator may be constructed as a unit stage or a separate test oscillator can be employed. Completely portable dry battery operation may be obtained.

This type of instrument has the disadvantage that an audio-frequency beat note must be obtained with the t. v. signal in order to deflect the indicating meter. The t. v. signal happens to be an amplitude-modulated wave containing at least one component (the picture modulation) which varies in amplitude. These variations can produce confusing fluctuations of the indicating meter. However, some smoothing out of this wavering can be expected if the stations are tuned-in during transmissions of test patterns instead of programs.

For best results, the a. f. amplifier section of this field strength meter must have flat response over the larger part of the spectrum, otherwise appreciable changes in meter deflection will result from shifts in beat-note frequency.

The heterodyne-type field strength meter is not readily calibrated to read signal strength directly in microvolts. The reasons for this are (1) change in detector efficiency from one channel to the other, (2) output-vs-frequency variations in the local oscillator, and (3) non-uniform gain in the audio amplifier. When it is used for comparative indications in a particular t. v. channel, however, its indications are dependable.

T. V. "Antenna Compass"

The so-called t. v. antenna compass uses the television receiver itself as a superheterodyne field strength meter and merely provides an indicating meter system. Figure 4 shows a typical circuit for this type of instrument.

The device consists of two sections: an indicating meter with sensitivity

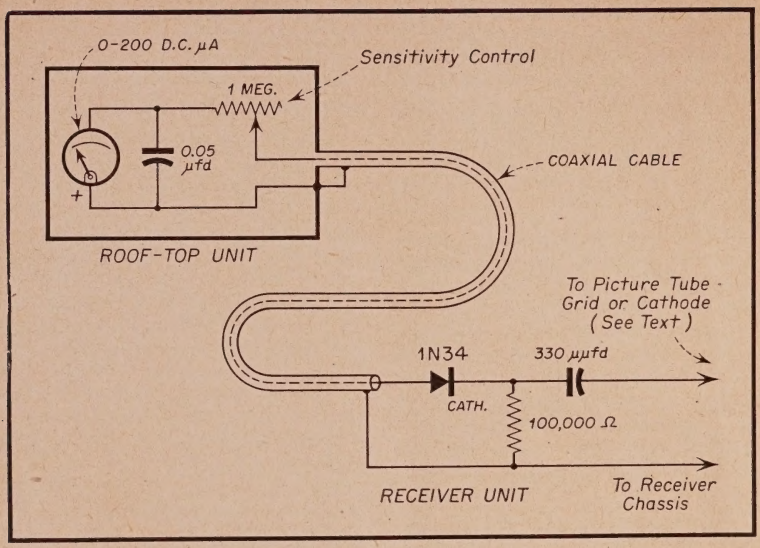


Fig. 4. T.V. antenna compass.

control rheostat operated at the antenna being adjusted; and a pickup probe, consisting of a crystal diode, coupling capacitor, and load resistor, connected to the t. v. receiver operating from the antenna. The two sections are connected together with a length of coaxial cable.

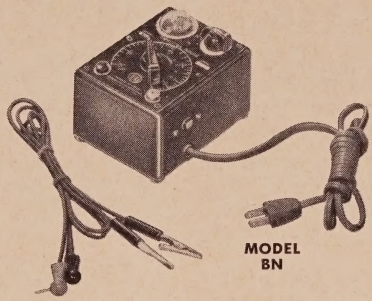
The "high" terminal of the pickup probe is connected to the grid or cathode of the picture tube, whichever receives the video amplifier output. When the grid is used, the 1N34 and microammeter will be connected with the polarities shown in Figure 4, since the video signal is negative. When the cathode is used, both the 1N34 and the meter must be reversed to handle the positive video signal.. The high lead of a manufactured t. v. compass usually is provided with a pointed clip which pierces the insulation of the picture-tube lead.

The receiver used with the compass must be tuned carefully to each channel in which checks are to be made. Generally, this will require an operator at the receiver in addition to the one at the remote indicating meter. The 1-megohm rheostat in series with the meter allows adjustment of meter current to prevent overswing on strong signals.

The simple "compass" is intended for use with different receivers having a variety of sensitivity characteristics. It accordingly cannot readily be made direct reading in microvolts. With a particular receiver, this instrument is entirely satisfactory for comparative measurements and, as such, is an ideal simple instrument for antenna orientation measurements. The coaxial cable which must be run to the roof top may be regarded as a slight inconvenience by some operators.

CORNELL-DUBILIER CAPACITOR BRIDGE - Model BN and CAPACITOR DECADES

MODEL BN CAPACITOR BRIDGE



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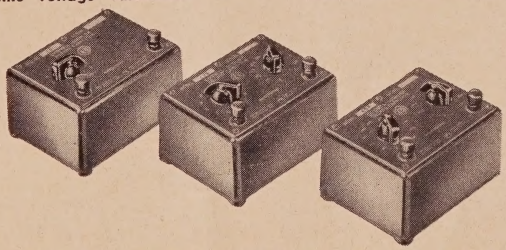
10. Attractive —Supplied in attractive walnut Bakelite case complete with detachable test leads and useful instruction booklet.



CORNELL-DUBILIER CAPACITOR DECADES provide a reliable and accurate source of measured capacitances for substitution purposes in a wide variety of electronic applications within the voltage and capacitance ratings of each unit.

Units of capacitance can be selected from the direct reading switch scale markings and the precise value may be read directly from the hand calibrated chart provided with each instrument.

CORNELL-DUBILIER CAPACITOR DECADES may be grouped in parallel to provide a wide range of accurate standards with maximum flexibility. For example, one each of decades CDA, CDB and CDC in parallel will permit a selection of capacitances from 0 to 11.111 mfds., in steps of .0001 mfd.

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CDB-3	1.1	mfd. in	.01	mfd. steps	3%	Oil-Paper	**13.20**
CDC-5	10.0	mfd. in	1.0	mfd. steps	5%	Oil-Paper	**19.25**
CDC-3	10.0	mfd. in	1.0	mfd. steps	3%	Oil-Paper	**21.45**

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FOR SALE—Plans for AC-DC practice oscillator; uses 117L7 tube. Tone and volume controls 50c ea. Daniel Electronic Lab., Box 56, East Haven, Conn.

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TRADE OR SELL—National boosters in unopened package. Want 7JP4 tube, test eqpt. or photographic items. W. Baer, 247 E. Frederick St., Lancaster, Pa.

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FOR SALE—Electronic table model radios. 5 tubes, 2 I.F.'s, loop aerial, mahogany, $11.45 net, ivory $12.45 net; guar. Earl T. Harker, 326 Westmoreland Dr., Trenton, N. J.

FOR SALE—Three wired Heathkits, exc. cond., comp. instr.; VTVM, mod. V2A, $19; sig. gen., mod. G1, $14; sig. tracer, mod. T1, $14; Abbott TR4A (2 met.) $15. Joseph F. Dineen, 9 Winter Terr., Westwood, Mass.

FOR SALE—Presto K8 recorder, 2 yrs. old; mod. 731 cardioid dynamic mike and accessories for comp. recording service. Write for list and low prices. Emilio V. Lippi, 1142 60th St., Brooklyn 19, N. Y.

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FOR SALE—Eico 320 sig. gen. for AM-FM and TV. Has 5 bands with audio and R.F. outputs. Like new, sell for best offer. Otto Kasten, 91 E. Main St., Buckhannon, W. Va.

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FOR SALE—Two good used tube testers in good cond.; test nearly all tubes; modernized Triplett 3212 and Supreme 589-A. E. Kiehnhoff, Wathena, Kans.

TRADE—Drake TV Interference filter, Telematch and book "TV and FM Receiver Servicing" by Milton Kiver, for high grade Tweeter. Eugene Roy, 5 Hillside St., Haverhill, Mass.

FOR SALE—Sunkraft Sunlamp $45 FOB; Astatic DN-HZ dynamic mike $12 FOB; 2 WE upright phones and ringer bores $5 FOB; Webster 80 wire rec., 10 hr. wire $55 FOB. Douglas Phillips, 311 Penfield, Rockford, Ill.

WANTED—Old Majestic 16 tube radio, mod. 11656, in working order or for replacement parts. Quote price, C. M. Dunham, 8 Norwich St., Worcester, Mass.

FOR SALE—Superior mod. 300 tube checker, perf. cond. $30; 5 vols. "Supreme Radio Diagrams", 1926 to 1942 incl. $12. I. Herman, 47 Gallatin St. N.W., Washington 11, D. C.

FOR SALE OR TRADE—Tel-A-Ray, Channel 6, antenna mounted booster $10; Ch. 6 mod. T yagi antenna $15; both like new. Virginia Radio Supply Co., Box 921, Charlottesville, Va.

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TRADE—RCA MI-12877 wire record. head, radio parts, books, etc. Want RCA MI-12877 wire recording cartridge, TV lens, IRC loudness control. Clinton Harden, Box 31, Sta. 7, Lawrence, Mass.

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FOR SALE—Navy type SE-1420C rec., 250-7500 meters with 2 stage amp., power supply and spkr., $35. Murray C. Ernst, 3 Vannoy Ave., Pennington, N. J.

SELL OR TRADE—NRI Radio-TV servicing course incl. all kits, $50 or equiv. G. S. Garrigan, 724 Suburban Rd., Union, N.J.

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FOR SALE—Two Philco CR-9's in orig. cartons, never used, $40 ea. J. Richard Edel, 168 Henry St., Hempstead, N. Y.

SWAP—Heathkit TV align. gen. (already built) with retrace blanking built in for Heathkit sine and square wave gen. Paul's TV Service, 156 W. 33rd St., Bayonne, N. J.

SELL OR TRADE—Super Sonic TV booster mod. 107. Trade for multitester, Radio City Prod. mod. 447 or Eico mod. 511 or EMC mod. 103. Alexander Podstepny, 217 Pine St., 3rd fl., Philadelphia 6, Pa.

SALE OR TRADE—Rider man. 1-10, 12, 14 and Sams Photo Facts 1-30. Best offer. How about 75 meter mobile rig? H. Leis, 2007 Vance Ave., Alexandria, La.

FOR SALE—BC221J crystal and orig. calib. book $45; Argus C3 camera; Turner 33X mike; ICS General Radio Course. Want VTVM, good movie projector. Clyde Keeler, 46 Seward Av., Port Jervis, N. Y.

SALE OR TRADE—BC348K, like new; BC-474A with AC and 6V power supply; 20 henry choke; filter cond's.; 7" Motorola TV; Meissner FM tuner; Link 10 meter mobile trans.; 6 and 12V storage batt's. Sell or swap for ham or photo gear. Leo Meister, 5 Highfield Lane, Nutley, N. J.

FOR SALE OR TRADE—Harvey-Wells TBS-50 trans. and power supply, A-1, $75 or best offer. Trade for good rec., nc-101 or 101X pref. H. W. Fleischut, 312 W. Railroad St., Pottsville, Pa.

FOR SALE OR SWAP—BC-221-O freq. met. with voltage regulated power supply and instr. book. Sell for $65 or swap for mobile ham gear. Monroe Corn, c/o Gen. Del., Red Bank, N. J.

BUY OR SELL—Sam's manuals, Riders manuals; what have you? L. Berkowitz, 31 Brainerd Rd., Allston 34, Mass.

TRADE—RCA AVR-20A rec. and aut. reel for .22 cal. pistol or port. set. H. F. Bernard, 3670 S.W. 9th Terr., Miami, Fla.

FOR SALE—304TL surplus, unused. Make offer. C. B. Kelley, 7204 Clovernook Av., Cincinnati 31, Ohio.

WANTED—Used TV sets in good cond., from 10" screen on up. Write us about how many you have and all details. Garza Radio Service, 417 W. Polk St., Harlingen, Tex.

FOR SALE—20" console TV, mahogany cabinet, comp. with mask, back and picture tube mounts, like new; fits 20" rect. pict. tube and 630 type chassis. First $30 M.O. takes it. Casimer A. Kusak, 111 Hirschbeck St., Buffalo 12, N. Y.

FOR SALE—1,000W gen., 32V belt drive $35; 1/6 hp motor 32V $9; 9" osc. fan, 32V $5; Powers no. 6 proj., with sound head $35. C. G. Peterson, Rosepine, La.

FOR SALE—Hallicrafter SX71 and Jensen spkr. used one week. John F. Ehrlich, 281 Schaffer St., Brooklyn, N. Y.

SALE OR TRADE—Sparx mod. 905A sig. tracer, never used $45; Vomax VTVM, like new $35. What have you to swap? Want sporting eqpt. Dick Miller, 1934 E. Broadway, Muskegon, Mich.

SWAP—Sam's Photo Facts 1-100, folders in albums, perf. Want tape recorder, Eico VTVM. Philann Radio, 1606 E. 56th St., Brooklyn 34, N. Y.

SWAP—Telekit 19" Intercarrier TV less tubes and cabinet, comp. wired and aligned, with 70° yoke, focus coil and ion trap. Want good VTVM. Prefer local trade. Irwin Kamner, 1951 Elston St., Philadelphia 38, Pa.

SALE OR TRADE—25W West. Elec. loud spkr tel amp. $25; E-200 sig. gen $35; Supreme tube tester $30; Superior VOM $20; Caliri solder gun $9.50; AAF helmet complete with phones $15. Grey Mather, 722 Charlotte St., Utica 2, N. Y.

SALE OR TRADE—Hickok sig. gen. mod. 288X, Precision sig. tracer mod. 200, like new. Sell cheap or trade for Continental Aircraft motor, 75-85 hp in good shape. Will pay difference. Earnest Couch, Jr., 113 Kent Rd., Huntsville, Ala.

TRADE—Car radio, 1941-48 Plymouth or Dodge, for test inst.; prefer VTVM. Greggs Repair Shop, 701 N. Garfield, Chanute, Kans.

FOR SALE—Rider man. 1-17 with index, exc. cond.; vol. 3-5 and 7 in green National Union binding $100 FOB. G. B. Morehouse, Box 179, Howard, Kans.

SWAP—Bogen mod. C12 amp.; works fine, some rust from standing. As is for ? A. Haftel, 1651 Montgomery Ave., Bronx, 53, N. Y.

WANTED—Coin operated radios. Please state make, quan. and price. Superior Radio Store, Lebanon, Ky.

FOR SALE OR TRADE—Comp. TV rec. and manuals from NRI adv. course. I need a scope. J. St. Johns, 2858 Lake Ave., Baltimore 13, Md.

FOR SALE—Radio Craftsmen FM-AM tuner. Used since Feb. 1952. Offers? G. A. Lindsay, 7 Bolser Ave., Natick, Mass.

WANTED—Latest NRI courses comp. with experimental parts. Cash. Harry Lichtner, 60 W. Tremont Ave., New York 53, N. Y.

FOR SALE—Sylvania 132 7" scope $75; Jacson mod. 637 dynamic output tube tester and multitester $40; 7EP4 CRT, slightly used $8. L. Matushefske, 2 Elmont Rd., Elmont, L. I., N. Y.

FOR SALE—Snaider P520 Projection TV set. Huge 20 x 26" picture! 37 tubes; 5TP4; Bausch & Lomb lens-mirror-glass screen system. List $1495, will sell to highest bidder. Full details on request. N. P. Forcier, Essex St., Middleton, Mass.

WANTED—By Muscular Dystrophy victim, tube tester, 6V batt. eliminator, radio parts, eqpt., radio books and magazines. Must be cheap. John P. Dzendzel, 829 Muhlenberg St., Reading, Pa.

SELL—Rider vol. 21; GE tube tester mod. TC-3, exc. cond.; comp. ICS Radio Service Course (no kits); Sams folders 6-46 and 7-46. Highest cash offer. H. Camhi, 105 East Way, Brooklyn 29, N. Y.

FOR SALE—2 140 mmfd midget variable condensers. They turn counterclockwise; catalog prices. Ned Blackwell, Box 7, Dickens, Tex.

WANTED—30 Mc. 2-way radio telephone, 50W output. H. H. Riley, Rt. 2, Aiken, S. C.

FOR SALE—Two comp. SCR 510 rigs. FM transceivers, 6V oper. with TS-13 handsets and 4 xtals. Like new, tested, tech. data incl. $100 takes the pair, postpaid. Demco Radio Service, 324 Oakwood Av., Marietta, Ohio.

FOR SALE OR TRADE—Single barrel shotgun with case, like new. Will trade as full or part payment toward good VTVM or VOM. Fred Hellauer, 4135 De Reimer Ave., Bronx 66, N. Y.

TRADE—Motorola 10" TV console, mod. 10VK9, in good cond. Ideal for 14" conversion. Want factory built oscilloscope. H. A. de Lima, P.O. Box 65, Seaford, L. I., New York.

SWAP—Have 16mm silent Moviegraph projector and 16 different 100-ft. films — comedy, cartoons, war movie reels. Want Hallicrafter or National rec. Sam Di Tucci, 234 Parkway, Rochester, N. Y.

WANTED—Book or manual on Schematic diagram of radio and TV rec., for cash. Joseph Giglio, 120 Forsythe St., N. Y. 2, N. Y.

FOR SALE—Simpson mod. 260 VOM $28.50; Everitt's "Fund. of Radio" $2; RCA HB-3 Tube Handbooks, vol. 1-6 $6; Cont. Motors Gas Eng.-Gen., 15 VDC, 350W $55; all A-1 cond., FOB. R. H. Ives, 663 Kempsville Rd., Norfolk 2, Va.

FOR SALE—Hi-fi sound system, comp. with cabinet, speakers, mike, and all acc., worth $275. Best offer over $95 takes it. Write for details. Mrs. H. P. Williams, 1029 Minor Ave., Hamilton, Ohio.

FOR SALE—Standard Instructograph with 20 tapes, A-1 cond. $20; BC454E mod. for 6V 3 to 6 Mc $10; Telrad 18A freq. standard $25, all FOB. Ernest Schultz, 2837 Goddard Rd., Toledo 6, Ohio.

WANTED—Mobile converter; state cond. and price. Model control eqpt. on citizens band. H. Sichler, 20 Speedway Av., Newark, N. J.

FOR SALE OR SWAP—NRI vol. I man.; NRI VTVM comp.; NRI Course in Radio and TV Servicing, inc. all kits. Want 8 mm movie camera or transmitting eqpt. or receiver. R. P. Larson, 500 Nuckols St., Red Oak, Iowa.

WANTED—Comp. Schematic drawings on WW II handi-talkie transceiver SCR 511, and info. on total number units orig. furnished to U. S. Will trade mint foreign stamps for radio parts. Glenn W. Dye, P.O. Box 121, Wildwood, N. J.

FOR SALE—Craftsmen R.C. 8 FM-AM tuner; Jerold TV FM booster; 15" Co-axel spkr; Mossberg .22 cal. rifle mod 151-M; 3 hi-fi amplifiers, RCA, 10 to 20W. L. P. Orlowski, Dunlap, Iowa.

TRADE—Hallicrafter 7" mod. T-54 TV in good cond. for various test eqpt. for TV. Harold Most, 1241 Ogden Ave., Bronx 52, N. Y.

SALE OR SWAP—Grege Synchrophase radio rec. type MU-1, serial BPCW, pat'd. 1925; wave length 526 to 175. Make offer. Want tube tester, tubes, etc. Burbage H. Buchanan, Hawk, N. C.

SALE OR TRADE—Hickok model 156 tradeometer used twice; all cables etc., $100 or trade for Hickok tube tester. Chester A. Place, RR 2, Plank Rd., 144A, Jeffersonville, Ind.

SELL OR SWAP—LM-10 xtal calib. freq meter, accuracy .02 % 125-2000 kc; .01% 2-20 Mc., exc. cond., $50 or 630 TV. Walter Zweig, 13-20 Sperber Rd., Fair Lawn, N. J.

FOR SALE—Comm. rec., Howard mod. 430, .55 to 43 Mc., comp. with RCA double doublet antenna and 3000 ohm phones, reas. Carl R. Magnusson, 6 Minthorne St., Worcester, Mass.

FOR SALE—Precision sig. gen. E-200C $45; Rider Man. vol. 15 $12; Precision tube tester mod. 612 $70, all like new. Mrs. L. Schoeppner, 59 Broadway, Massapequa Park, L. I., N. Y.

WANTED—Hallicrafters S38 or similar small receiver. Leo Teply, Geddes, S. D.

FOR SALE—Phila. or vicinity, inter-comm, three masters, Operadio Executive 10 series; each master has 10 pushbutton stations, exc. cond. Best offer. L. Buddine, 4624 Old York Rd., Philadelphia 40, Pa.

WANTED—National SW-3 and Stancor 10-P transmitter in good. cond. Walter E. Miller, Haworth, N. J.

FOR SALE—Rider Man. vol. 1-21, perfect cond. Will consider highest offer. Mrs. Rose Goggins, 17 O'Brien St., Norwalk, Conn.

WANTED—Triplett BV adapter; Hickok 450 VOM; Telex pillow spkr; Brush Hushatone mod. BA303; Brush A Lorgnette phone; S-72 Hallicrafter; 7 x 50 binoculars. Will trade tubes or pay cash. G. H. Swiska, 109 E School St., Woonsocket, R. I.

FOR SALE—Rider Man. 1-5 $10 ea.; 6-13 $8 ea. FOB. Leitch Radio Elec., 34 Park Drive, So., West Orange, N. J.

TRADE—Victor 16mm sound proj. mod. 40; 2 cases, 12" spkr, like new; cost over $500. Want comm. rec. in good cond. Prefer deal in New York area. H. H. Ragatz, 756 Springfield Ave., Summit, N. J.

SWAP—6 shooter .44 revolver, Brevet Nagunt 107, for good cond. tester. Oswald Maillet, 5 Emerald St., Gardner, Mass.

SALE OR TRADE—Clarus MS 35 camera, like new, sync., Wollensak Raptar coated f2 lens, $100 or trade for test eqpt. or comm. rec. Al Werhan, Manlius, N. Y.

FOR SALE—Rider Man. 1-18; 1 and 2 TV; record changer, 21 vol. in exc. cond., $110; table model TV, like new; turntable $3.50; large table model magnifier, solid glass $12. James Gillespie, 12 Winding Way, Pompton Plains, N. J.

SALE OR SWAP—RCP sig. gen. mod. 705A; Superior meter mod. 670, lacks needle movement; German Welta 35mm 2.9 lens camera; Carl Zeiss Jena 8 x 30 binoc. Want tape recorder. P. Kacoure, 148-09 Jamaica Ave., Jamaica, N. Y.

FOR SALE—Hallicrafter T-64 TV chassis for 10" or 12½" picture tube in orig. cart. with 10" RCA Px tube $50; Industrial type IT-75AA auto. booster, like new $15; Jerrold booster in broken case $5, all with instr. T. E. Larson, RFD 1, Delaware, Ohio.

FOR SALE—Radio & TV repair store. Good opportunity; plenty of repairs, small rent. Don't have enough time for business. Call after 6 P.M. or write. T. Wojciechowski, 599 Liberty Av., Bklyn. 7, N. Y.

WANTED—Old issues of "C-D Capacitor" prior to vol. 17, no. 4. Also Sam's Photo Facts. State what you have and price. Will wire any kit, reasonable. Joseph W. Rath, Jr., 3124 Poppleton Ave., Omaha 5, Neb.

SWAP—Argus PB 200 series proj. with slides, value about $75, for TV set in working cond. You send COD, I'll send COD. Anders Radio & TV, Nelsonville, Ohio.

FOR SALE—Gonset Triband converter, Master Mobile ant. with 75M coil, 10 Meter 15W mobile xmitter, 25' RGU/53 and 4' RG/8U co-ax, in good working order, $70 postpaid or make offer. Al Braun, YMCA, Waterloo, Iowa.

SALE OR TRADE—Rider Man. 15-18; Weaver J-4 scope and mounts; table-size cigarette slot machine; 12GA Lefever D-B and 166A Westernfield deluxe pump gun. Want Sam's 1-5; Weaver K-6 scope; .22 auto. pistol; .22 junior size rifle. Dean H. Ford, 514 Park Ave., Kokomo, Ind.

FOR SALE—Superior sig. gen. mod. 650 $11 and Electronic Designs mod. 100 $15, or both for $24. Henry D. Hanley, 60 Burt St., Dorchester 24, Mass.

SALE OR TRADE—Rider. Man 9-11 and NRI vol. 1, good cond. Want Rider Man. 14 and 15. Earl Tarvin, R.R. 1, Melbourne, Ky.

FOR SALE—Plate transformer 180-0-180V 200 Ma, 360-0-360V 200 Ma, 720-0-720 1100V 200Ma, 0-1000-5500V 1 Ma, 115/230 V 50-60 cy pri, like new, $25; Link mod. 205-Ed-3A single chan. mob. rec., 1630 kc., comp., make offer. J. Weisberger, 3715 Kings Highway, Brooklyn 34, N. Y.

SALE OR TRADE—Sunray "23" enlarger, like new; Motorola 7" TV; Challenger PA system with mike, less spkr, works perf. Want tape recorder, com. rec., xmtr. or make offer. Richard Paul, RFD 2, Paw Paw, Mich.

FOR SALE—Sam's Photofacts in binders, vol 1-4; numerous parts, resistors, transformers, etc. John H. Cox, Jr., RD 1, Box 28, Saugerties, N. Y.

SWAP—GE self-charging port. radio, mod. LB-530, hardly used, for late edition NRI Radio Course. Must be complete and in perf. cond. Local only. B. Ancel, 1311 Morrison Ave., Bronx 59, N. Y.

FOR SALE—Newcomb 30WT amp., perf. cond. Need good tube tester. H. Wright, 146-15 130 Ave., South Ozone Pk., N. Y.

FOR SALE—Closing out Radio & TV Shop. Write for list of manuals, parts, tools, equipment, tubes, etc. Frank Kesto, R 1, North Rose, N. Y.

WANTED—Carbon hand mikes made by Hudson-American. Mike has ring for hanging up and rubber covered cord and no push button or switch as most War Surplus items. Blan, 64 Dey St., New York 7, N. Y.

SALE OR SWAP—Packard car radio no. 382042, like new, for '46 and '47 cars, for Chev. '48 car radio in perf. cond. Also have large list of xmtrs, TBS50c-EV-10 tester RCA 50W police transmitters, etc. Nelson K. Stover, P.O. Box 722, York, Pa.

FOR SALE—Rider Man. 1-5 abridged, 6-17 all like new, $100. S. R. Rauch, 396 W. Clements Br. Rd., Runnemede, N. J.

FOR SALE—M83 mod. RCA auto radio used on '38 Chev., good cond. New $63. Best offer. A. V. Richardson, National Co., 61 Sherman St., Malden, Mass.

WANTED—Four WD11 tubes for old fashioned radio. Will buy or trade if reas. Send self-add. envelope for swap list. Lefferson Radio, 405 S. Walnut, Bloomington, Ind.

FOR SALE OR TRADE—150 issues of Radio-Craft magazines dating from July 1929 (first issue) to Dec. '45. No duplications. Need audio eqpt. or what have you. Anthony Manfredi, 91 Barker Av., Eatontown, N. J.

TRADE—Elec. razors: Remington Blue Streak Triple; Remington threesome, like new. Want LM frek. meter with power supply. Will consider test eqpt. or Hallicrafter rec. F. W. Cooper, Sedgwick, Kans.

FOR SALE—Rider Man. 1-3 cond., and 9, $6 ea. or both for $10. Down payment, balance COD. J. O. Basham, Altamont, Covington, Va.

WANT—Microwave eqpt; G-R, Ferris, etc. units; 723A/B, 3C22, other tubes; manuals, meters, parts, cable. Quick cash, or trade 35mm cameras, surplus film, TV, ham gear, etc. Littell, Farhills Box 26D, Dayton 9, Ohio.

SALE OR TRADE—Lab. standard AC-DC dynamometer voltmeter, scales 130V, 260 V, 650V, accuracy 1/2%; Weston panel mod. 643, 0-10 VDC, 0-25 amps DC; drafting instr. and slide rules, all perf. Want VTVM multitester, etc. A. A. Fertig, 589 Anderson Ave., Woodbridge, N. J.

FOR SALE—Hallicrafter mod. S-38B $37.50, like new; might exchange for FM-AM Zenith H725 with add'l payment. Ernest Mueller, 44 Carlton St., E. Orange, N. J.

SALE OR SWAP—GE and Sylvania comm. and household lamps, fresh VS 016 RCA batteries (dated 127CW), 10" tube, radio and TV tubes. Swap for tools or gear of all kinds. Whitmore Radio Clinic, 331 N. Stevens Ave., Springfield, Ill.

FOR SALE—NRI electronic multitester with carrying case and test probes, special-built power pack for 115V 60 cyc. line., exc. cond., . .$15 FOB. N. Liemberger, 193 Windermere Blvd., Buffalo 23, N. Y.

WANTED—Schematic diagrams for Patterson PR-15 rec., on loan. John H. Ramsey, 81 Spring Garden St., Hamden 14, Conn.

FOR SALE—Heathkit mod. SG 6 sig gen., like new, wired and aligned $14; Ted McElroy code practice oscillator employing the 117L7GT with 5" spkr, vol. cont., phone taps in sloping black plastic case $5. Louis T. Pignatello, 2070 Union St., Brooklyn 12, N. Y.

FOR SALE—Rider Man. 10-17, all 8 vol. for $65 FOB, you pay postage. R. F. Olson, 3556 Lime Ave., Long Beach 7, Calif.

FOR SALE—All triode hi-fi studio amplifier, 10W undistorted. Needs minor overhauling; outstanding bargain $75. N. Hulemark, 130 75th St., Bklyn. 9, N. Y.

TRADE—10" Admiral TV in good cond. for any make auto, 1916 or older. Prefer Ford 1909-12. Will consider difference either way, or pay cash. Harold Garrett, 711 S. New York, Sedalia, Mo.

SALE OR TRADE—1500 tubes plus other parts and radio and TV test eqpt. for house trailer. William Bashta, 2016-B 45th St., Los Alamos, N. Mex.

WANTED—Plug-in coils for Wilcox CW-3 rec. Comp. sets of 3 (ant., R.F., and osc.) in Group I, II, III, and/or IV. State price, or will send list of items to trade. W. E. Van Horn, 613 Susq. Ave., Sunbury, Pa.

SALE OR TRADE—New Motorola auto. record changer, 45 rpm, mod. M45C; cost $13; a buy at $8. Stanley Strangle, Trout Creek, Box 6, Mich.

FOR SALE—Mod. 210 Tele-King TV 10" rec.; Walker-Turner bench type drill press; miniature tubes; Casco Handi-Tool Set, all in good cond. Write for prices. Marvin Shapiro, 1240 Sherman Ave., Bronx 56, N. Y.

FOR SALE—Collins 32RA transmitter; RCA BC-312M and Hallicrafter SX-11 recs.; Heathkit 0-7 oscilloscope and C2 cond. checker; Telrad 18A freq. stand.; Precision E200C sig. gen.; all for $425. E. E. Martin, 7 Maiden Lane, Glen Head, L. I., N. Y.

SALE OR TRADE—RCP sig. gen.; 6 tube Meck radio; 3 tube Kent radio (new 25-B8GT/G); NRI Radio Repair Course; "Radio Phys. Course" and "Modern Radio Servicing" by Ghirardi. Want cash or 35mm camera. Gerard W. Thibodeau, 31 Elm St., Fort Kent, Me.

FOR SALE—Instruction diagram and parts list for building a 20-tube 5" TV rec., using 5BP4 as indicator from standard parts. Write for information. A. LaPerriere, Vercheres, Quebec, Canada.

FOR SALE—BC-733-D 24 V.D.C., dynamotor; NC 156 comm. rec., will ship FOB; Howard FM converter, mod. 482; Olster hand vibrator. Make offer. Charles Johnston, Gen. Del., Langley AFB, Va.

SELL—Rider Man. 1-14; Sam's Folders 1-132; Meissner analyst; Precision sig. gen.; Eico VTVM; Heath scope; Carron Beat freq. audio gen. Best offers any or all. J. L. Bittner, Box 196, Warsaw, Va.

SALE OR TRADE—Two Mallory rectifiers F20B3, 16V. output at 15 amp.; used 2 hrs.; 2 Radiart vibrators, 5435-4, like new. Entire lot $8 insured and postpaid, or trade usable port. elec. phono. or table mike stand. Sahr Radio, Fairmont, Minn.

WANTED—For my hobby, certain old radios and phonographs, especially Victor and Edison phonos. Literature and instruction booklets for any appreciated. W. H. Miller, 1017 Westgate Rd., Troy, Ohio.

FOR SALE—Two table phono radio comb's, nice cabinets, radios perf., changers need work, ea. $15. One Emerson 552, one Sonora RKR 215. Sam N. Narefsky, 4031 48th St., Long Island City 4, N. Y.

SWAP OR SELL—"Devil Dog" burglar alarm, books, Radio News and other magazines, lists to swap. Want Sam's Photofact Folder Sets from no. 1 up. Comp. and in good cond. Louis Leibovitz, 3835 Cambridge St., Philadelphia 4, Pa.

WANTED—Schematics and oper. instr. for Supreme Vedolyzer mod. 560-A. If not for sale, will rent for 30 days. State price and cond. or rent charge. James E. Wolfe, 19 Selfridge Rd., Balto. 20, Md.

WANTED—McMurdo silver mod. 903 absorption wave meter and coils up to 500Mc. If in good cond., will pay orig. net price. Al Johnson, 24 N.E. 58 St., Miami 37, Fla.

TRADE—Concert piano accordion, 120 bass, 6 shifts, good cond. Want good TV, scope and sweep gen. Stephen Medeiros, 518 Palmer St., Fall River, Mass.

FOR SALE—Rider's 1-5 abr., 6-16, in exc. cond., with indexes. Replacement value $180. Offers wanted. Donald Patrick, RFD 5, Omaha 7, Nebr.

FOR SALE—Hickok 288X $99; Heathkit 0-5 oscilloscope $35; Heathkit TS-2 TV gen. (factory checked) $39. All units like new, comp. with inst. man. Electronic Labs, 2444 D St., Lincoln 2, Nebr.

FOR SALE—Meissner sig. shifter, latest model, factory wired, assembled with all coils, tubes, power supply, never used $80. D. S. Bolaffi, 551 Fifth Ave., New York, N. Y.

FOR SALE—RCA dynamic demonstrator, AM-FM, type WE82A, like new. Crescent City Trade School, 2445 St. Bernard Ave., New Orleans, La.

SELL OR TRADE—Weston mod. 785 industrial circuit tester; Weston mod. 695 power level indicator; Weston mod. 697 VOM meter; 20 6AK5's, 10 956's, 5 955's; Radio Phys. Course, 2d rev. ed. by Ghirardi. Alvin Lanford, 129 Canterbury Rd., Spartanburg, S. C.

SALE OR TRADE—Best cash or trade offer takes 6 Rider Man. 11-16; Feiler tracer stethoscope TS-3A; 6 x 30 binoculars like new; Precision sig. tracer. Also other items; send for list. E. G. Bartlett, Box 86, Atlanta, Mo.

WANTED—McMurdo 700 transmitter; Hallicrafter SX-25 rec. Have PE-103 gen. with base. BC-229 rec. Charlie Stiles, 816 Platte Ave., Alliance, Nebr.

FOR SALE—Meissner sig. shifter, latest mod., covering 80-40-20 and 10 meters, exc. cond. $65; Perfex deluxe 35mm camera with Wollensak F2 coated lens, case, flash gun, comp. $65. Lloyd L. Gainey, Hoffman Ave. and Marlton Pike, Merchantville 10, N. J.

WANTED—Navy Selsyns, types 1F, 1G, 1CT, 5F, 5G, 6G, 7G, etc. Autosyns: AY1, AY5, AY101D, AY201, etc. Tubes, test eqpt., Sig. Corps eqpt. Send lists. Top prices. A. L. Berg, 108 Pearl St., Boston 10, Mass.

FOR SALE—Sam's Photofacts, vol. 1-116, in binders. Also Rider Man. 8-14, all in exc. cond. C. Wayne Spencer, 2419 9th Ave. S.W., Cedar Rapids, Iowa.

WANTED—Old 16" broadcast transcriptions of Pipe organ such as Lew White, Jesse Crawford, Don Baker, etc. Please state cond. and price. Harry J. Roach, Box 801, Tulsa, Okla.

FOR SALE—Premier AM sig. gen. mod 570, 75 kc to 150 mc; beautiful job, only $40. N. Y. C. or vicinity. Theodore Popel, 1223 Elm Ave., Brooklyn 30, N. Y.

TRADE OR SELL—Two 7" TV sets and Magnavox wireless intercoms (need minor repair); several old radios, chassis, speakers; Triumph tubetester mod. 444. Cash or needed bench eqpt. Harold Gruen, 24 N. Newport Ave., Ventnor City, N. J.

FOR SALE—Radio City sig. gen. mod. 701 $25; Radio City tubetester mod. 307 converted to 308 $20; Precision VOM mod. 840 $20, all in good cond. Want McMurdo Silver gen. mod. 906 in good cond. Stevens Radio Shop, Raymond, N. H.

SALE OR SWAP—8mm camera and projector; also 16mm camera (elec.) and projector, both silent. Allied Radio & TV, 960 E. 12th St., Brooklyn, N. Y.

FOR SALE—Emerson and Wilcox-Gay disc recording eqpt., very reas. Excellent for experimentation and fun; low cash for quick sale. Radio-Electric Service, 140 Printz Ave., Norwood, Pa.

FOR SALE—Back issues of Radio & TV News, special Radio-Electronic Eng. ed. 5 years, 1946-1950 $5, or best offer, plus postage. Austin F. Marx, 2734 Mildred Ave., Chicago 14, Ill.

TRADE—Radios, parts, tubes, ham radio items for old brass music instruments, not in playing cond. Also curios of all types. H. J. Wax, 264 Division Ave., Brooklyn, N. Y.

SALE OR TRADE—Will pay cash or swap TV set, battery eliminator, 8mm Mauser, 9mm Luger, German binoculars, for late mod. tube checker, sweep gen. and good comm. rec. Bernard Franklin, Hartsville, Tenn.

FOR SALE—Rek-O-Cut recording table and overhead cutter, mod. TR-12, like new. Sac. both for $150. M. C. Hofmann, 14425 S. Normal, Chicago 27, Ill.

FOR SALE—Electronic Instrument mod. 320-K sig. gen $20 and E.I. new 950K cond. checker, fact. checked, $27.50, both like new. Will trade for National or Hallicrafter rec. A. M. Bryan, Box 557, Gainesville, Fla.

FOR SALE—Supreme mod. 650 3" oscilloscope, like new. Best offer takes it. John G. Perkovich, R 1 Box 150, Waldo, Wisc.

SELL OR SWAP—Gen. Electronic sig. gen. mod. 200, like new $18; 70 50c phono needles $7. Trade for tube tester, 7" TV, NRI service manuals 1 and 2, or ? Bruno DeCola, 379 S. Broadway, Salem, Ohio.

FOR SALE—RCA high freq. sweep gen. type 709, like new; separate power supply, instr. book inc.; built-in marker. Both units in crackled gray and etched stainless steel. Price—best offer. Davega Stores Corp. ,Exec. Off., Port Auth. Bldg., New York, N. Y.

FOR SALE—Webster-Chicago wire recorder mod. 80-1, acc. and 3 1-hr. spools of wire, all A-1 cond., asking $80 FOB. Want amp. of RCA Victor mod. R78 using pair of type '46 tubes in output stage. Power transf. and spkr only need be in first class shape. Robert L. Bradford, P.O. Box 1506, Decatur, Ala.

SALE OR TRADE—RCP mod. 411 supertester, Preston set analyzer, Sterling tube tester, all $75, or separately. Will swap for scope or TV sig. gen. B. B. Heigh, 45 S. Elliott Pl., Bklyn. 17, N. Y.

FOR SALE—Due to death of husband, entire stock, tubes, parts, Tv antenna, Precision E-300-C sig. gen., Precision 920 tube checker, Precision VOM, Permapower dry batt. eliminator and Electrox AR-1 batt. eliminator. Mrs. Clyde Denson, 701 Canal St., Decatur, Ala.

SALE OR TRADE—Six 5000 volt multitesters, Rider Man. 1, 6, 8, 9; auto tools, all sizes; radio tubes, text books, meters. G. F. Roby, 6137 Wentworth Ave., Chicago 21, Ill.

SALE OR TRADE—Comp. radio correspond. course with advanced TV; no equipment. A. Speaker, Box 702, Huntington Park, Calif.

WANTED—Heath cond. checker kit, any cond. Will swap Radio Design VOM, like new, or cash. L. Cohen, 150-09 34th Ave., Flushing, N. Y.

FOR SALE—Precision mod. 510 tube tester, in good cond. $12; Daco tube tester mod. 606, like new $18; Zenith auto. phonomotor, 2 speeds $10. J. Kramer, 229 E. 7th St., New York, N. Y.

FOR SALE—Mod. G-2 Heathkit audio oscillator, audio amp. as described in June 1950 Radio & Tel. News, using pair of 807's and UTC LS57 output. trans., also Electro Voice mod. Sp-12B spkr. Kenneth E. Gould, 878 Mill St., Watertown, N. Y.

METER SERVICE—We repair and calibrate all makes and types of electrical meters. Authorized factory service and overhaul station for Assembly Products, Inc., Chagrin Falls, Ohio. Eastwood Instrument Laboratories, P. O. Box 315, Strongsville, Ohio.

FOR SALE—Hallicrafter S-38B, used only few times $37. L. Spada, 4 Eastview Terr., Rocky Hill, Conn.

FOR SALE—1939 Buick radio $10; R705 Delco radio $25; 6 tube '41-'48 Chev. radio $20; Underdash Truetone radio $15; Philco 7020 scope like new, cost $139, $125. Craycraft Radio Service, Williamson, W. Va.

FOR SALE—VOM NRI Prof. mod. 45, like new $30.; with new KV probe $37.; supplied with test leads and instr. man. Henry F. Buchanan, 2729 W. Main St., Louisville 12, Ky.

SALE OR TRADE—Webster 56, Philco M12C auto record changers, like new; NRI Radio Course and kits. Want good S38 or S53 rcvr.; HQ 129X, SX43, S76 or SX25 like new. State lowest price. Don Jensen, 125 E. 3rd St., Wray, Colo.

FOR SALE—Jensen A-12 ext. range hi-fi electro-dyn. loud-spkr, 8-ohm voice coil, 2500-ohm 14W field wind., 15W output $5; exc. cond., exp. collect. David Hodges, 7 Sycamore St., Bronxville 8, N. Y.

FOR SALE—UTC output transf., type LS55 $10; Clarkston RV cart. and needle .0025 8; Gen. Ind. phono motor, 80 rpm, 115V 60 cycle $4; Jefferson output transf., 467-416 $4. E. F. Vanicek, 1265 Olmstead Ave., Bronx 61, N. Y.

FOR SALE—40W phone CW trans. comp. with power supply, tubes, meter, 10 M coil and cabinet $65; 75 CW trans. comp. $40, and misc. items of ham eqpt. C. D. Hughson, 303 2nd St. N., Chipley, Fla.

FOR SALE—Precision E-200C sig. gen.; E-400 sweep gen.; ES-500 scope; 10-12P tube tester; EV-20 VTVM with HV and RF probes; Sam's 1-14, all like new, complete. Make offers to J. Raposa, 167 Washington St., Fall River, Mass.

FOR SALE—Comp. DeForest home lab. and inst. for over 133 projects, $30 FOB. Want Scott AM-FM radio phono in 1st class cond.; give full details. H. M. Denison, 21 S. 4th St., Columbia, Pa.

FOR SALE—RCA audio chanalyst type 170-A; audio voltmeter WV-73A; Eicor tape recorder mod. 1000; Gen. Radio strobotac type 631B. Make offers to Joseph Britto, 96 Ruth Ave., Rumford, R. I.

WANTED—Crosley TV mod. 9-407 or 9-407-M1 or M2. Will make minor repairs. State price FOB. D. J. Hemingway, 25 Oak Knoll Rd., Natick, Mass.

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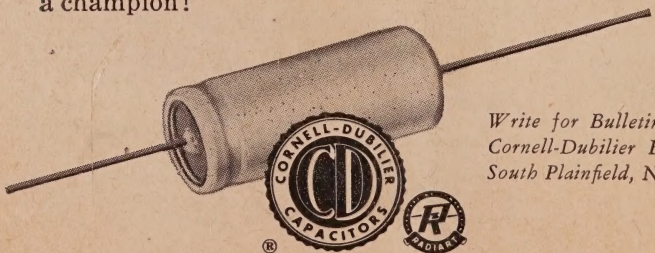

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